



Indiana Department of Education
SUPPORTING STUDENT SUCCESS

ISTEP+: Algebra I

End-of-Course Assessment

Released Items and Scoring Notes

Introduction

Indiana students enrolled in Algebra I participated in the *ISTEP+: Algebra I Graduation Examination* End-of-Course Assessment (ECA) during the 2011-2012 test administration windows. The Algebra I ECA consists of four item types which contribute to a student's scale score: multiple-choice, constructed-response, gridded-response and graphing items. It is important to keep in mind that a significant portion of a student's score is calculated from the multiple-choice items on the assessment, which are not addressed within this document.

This document consists of constructed-response and graphing items from the Spring 2012 administration and includes:

- Sample released open-ended questions
- Rubrics used by trained evaluators to score student responses
- Sample papers used by trained evaluators to distinguish between rubric score point values
- Annotations describing the rationale for scoring student responses

The purpose of this guide is to provide additional Algebra I ECA sample items and to model the types of items that are scored using rubrics.

Reporting Category 1: Solving Linear Equations and Inequalities

Question 1

The perimeter of a rectangular garden is 35 feet. The length of the garden is 1 foot more than 2 times its width.

Write an equation to represent the perimeter of the garden in terms of its width (w).

Answer _____

What are the length and width of the garden in feet?

Answer _____

Exemplary Response:

- $6w + 2 = 35$

Or other equivalent equation

And

- Length = 12 feet
Width = 5.5 feet

Rubric:

- 3 points:** Exemplary response. Correct equation in Part A and correct values for the width and length in Part B.
- 2 points:** Correct equation in Part A and either the correct length or width in Part B. Or, correct length and width in Part B. Or, a correct equation in Part A and the correct values for the length and width labeled incorrectly in Part B.
- 1 point:** Correct equation in Part A. Or, correct values for both the width and length in Part B based on an incorrect equation in Part A. Or, the correct values for the length and width labeled incorrectly. Or, the correct length or width.
- 0 points:** Other

Question 1, Sample A – 3 points

Part A: $(2w + 1) + (2w + 1) + w + w = 35$

Part B: $w = 5.5$ and $l = 12$

Notes: This response is equivalent to the exemplary response.

Question 1, Sample B – 2 points

Part A: $35 = 2w + 2l$

Part B: Width = 5.5 feet, Length = 12 feet

Notes: This response shows the correct length and width in Part B; however, the equation in Part A is incorrect. Although the equation given is a correct general equation to represent the perimeter of a rectangle with perimeter 35 feet, the directions state to write the equation in terms of w . This equation is written in terms of w and l . The given information regarding the length being one foot more than two times the width was not taken into account. Thus, the equation written does not receive any points.

Question 1, Sample C – 2 points

Part A: $2w + 1 + w = 35\text{ft.}$

Part B: $L = 12\text{ ft.}$, $W = 5.5\text{ ft.}$

Notes: This response shows the correct length and width in Part B; however, the equation in Part A is incorrect.

Question 1, Sample D – 2 points

Part A: $2(2W+1)+2W=35$

Part B: $W = 5.5$ feet and $L = 10$ feet

Notes: This response shows a correct equation in Part A and the correct width in Part B; however, the length given in Part B is incorrect.

Question 1, Sample E – 1 point

Part A: $8w \cdot 2$

Part B: width 15, length 12

Notes: This response shows a correct length in Part B; however, Part A is incorrect and the width is incorrect.

Question 1, Sample F – 1 point

Part A: $35 = 2x + 1$

Part B: length is 5.5, width is 12

Notes: This response shows an incorrect equation in Part A. In Part B, the values for the length and width are correct, however, they are labeled incorrectly. This is a good example to share with students to emphasize checking their work and attending to precision when communicating mathematics.

Question 1, Sample G – 1 point

Part A: $2w + 1 + w = 35$

Part B: The length is $7\frac{1}{3}$ feet. The width is $3\frac{4}{3}$ feet.

Notes: This response shows an incorrect equation in Part A; however, the length and width in Part B are correct based on the incorrect equation in Part A. This is a good example to share with students to encourage following through with all parts of a question as partial credit may be awarded even if the first part of the question is answered incorrectly.

Question 1, Sample H – 0 points

Part A: $1 + 2w = 35$

Part B: 35

Notes: Both parts of this response are incorrect.

Reporting Category 1: Solving Linear Equations and Inequalities

Question 2

Claire tried to solve the equation below. She made an error.
Her work is shown below.

$$2(x + 4) - 1 = 13$$

$$2x + 4 - 1 = 13$$

$$2x + 3 = 13$$

$$2x = 10$$

$$x = 5$$

Describe the error Claire made.

<hr/> <hr/>

Solve: $2(x + 4) - 1 = 13$

Answer _____

Exemplary Response:

- Claire did not distribute the 2 to all terms in the parentheses. Or, Claire should have multiplied the 4 by 2. Or, Claire should have gotten $2x + 8 - 1 = 13$. Or, some other acceptable description of the error. Note: A student's response may reference what was done incorrectly or what should have been done instead of the error.

And

- $x = 3$

Rubric:

- 2 points:** Exemplary response. Provides an acceptable description in the Part A and finds the solution of x in Part B.
- 1 point:** One correct component. Provides an acceptable description in Part A. Or, finds the solution of x in part B.
- 0 points:** Other

Question 2, Sample A – 2 points

Part A: She didn't completely distribute. It should be $2x + 8$, but she put $2x + 4$

Part B: $x = 3$

Notes: This response is equivalent to the exemplary response.

Question 2, Sample B – 1 point

Part A: Claire only took the two outside of the parentheses and timesed it by the x and not both to x and 4.

Part B: $2x + 8 - 1 = 13$

Notes: This response gives a valid description of the error; however, the solution in Part B is incomplete.

Question 2, Sample C – 1 point

Part A: She didn't times 2×4 she just put 4 but really it should be 8.

Part B: $x = 2$

Notes: This response gives a valid description of the error; however, the solution in Part B is incorrect.

Question 2, Sample D – 0 points

Part A: She wasn't supposed to get rid of the parentheses

Part B: $x = 5$

Notes: Both parts of this response are incorrect.

Reporting Category 1: Solving Linear Equations and Inequalities

Question 3

Julia is trying to decide between the following phone plans.

- **Plan A costs \$60 per month and includes 500 minutes. There is an additional charge of \$0.05 for each minute used over 500.**
- **Plan B costs \$25 per month and includes 200 minutes. There is an additional charge of \$0.10 for each minute used over 200.**

If Julia uses 450 minutes per month, how much less will it cost her each month if she uses Plan B instead of Plan A?

Answer _____

How many monthly minutes of phone use make Plan A and Plan B cost the same amount per month?

Answer _____

Exemplary Response:

- \$10

And

- 600

Rubric:

2 points: Exemplary response.

1 point: One correct component.

0 points: Other

Question 3, Sample A – 2 points

Part A: \$10

Part B: 600

Notes: This response is equivalent to the exemplary response.

Question 3, Sample B – 1 point

Part A: \$10

Part B: 15

Notes: The response for Part A is correct; however, the response for Part B is incorrect.

Question 3, Sample C – 1 point

Part A: \$50

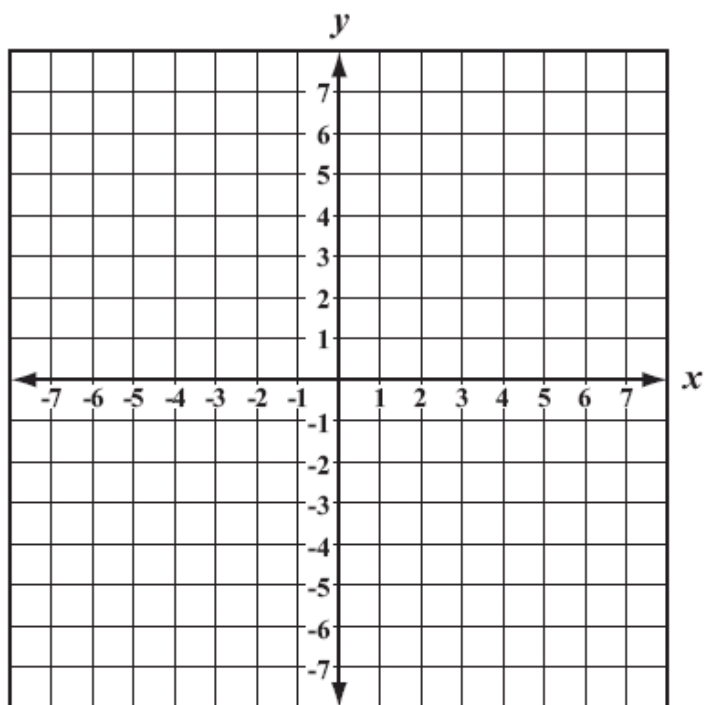
Part B: 600

Notes: The response for Part B is correct; however, the response for Part A is incorrect.

Reporting Category 2: Graphing and Interpreting Linear and Non-Linear Relations

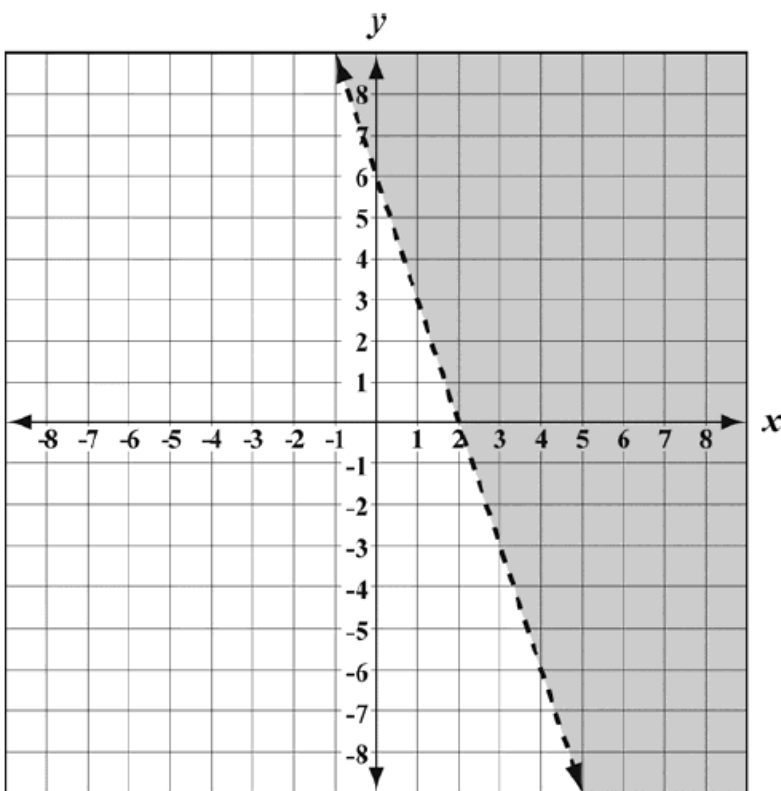
Question 4

Graph: $3x + y > 6$



Exemplary Response:

- The graph of $3x + y > 6$.



Rubric:

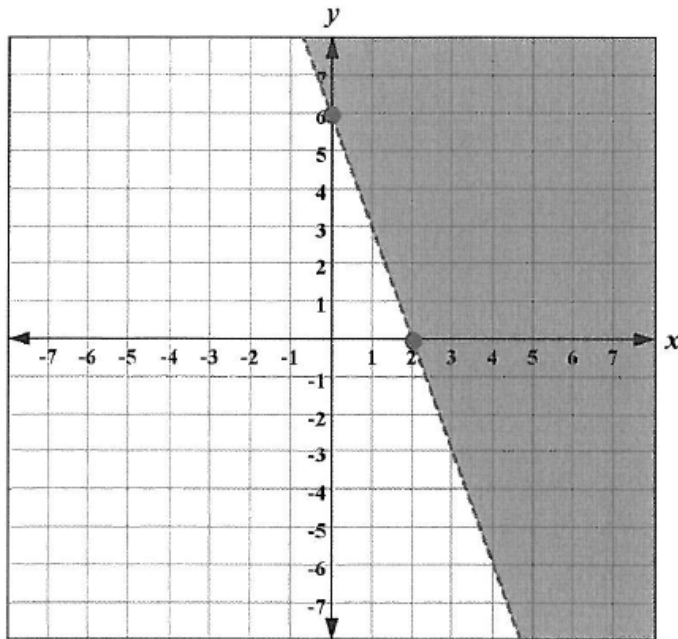
2 points: Exemplary response.

1 point: The graph of $3x + y = 6$ using a solid or dashed line with incorrect or no shading. Or, an incorrect dashed line shaded correctly. Or, a correct solid line shaded correctly.

0 points: Other

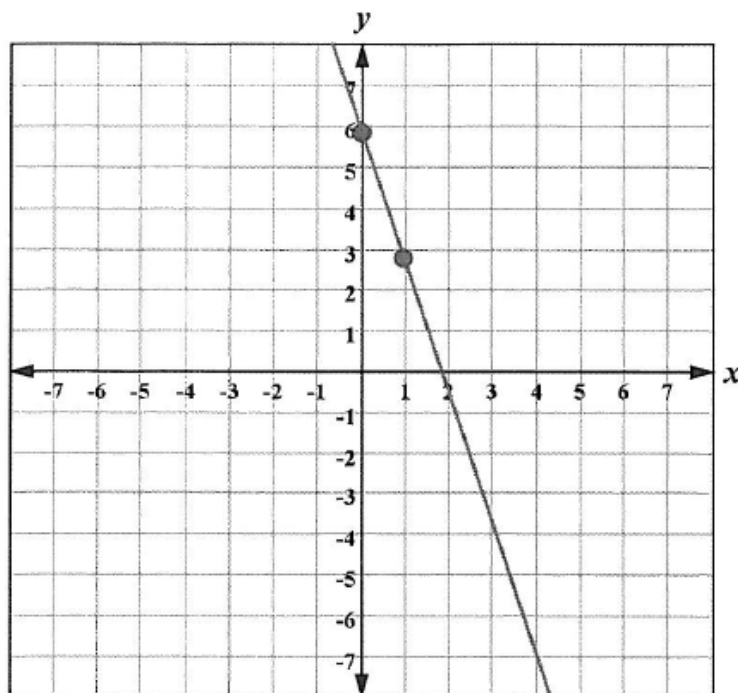
Note: If more than one line is graphed or incorrect points are plotted, no points will be awarded.

Question 4, Sample A – 2 points



Notes: This response is equivalent to the exemplary response.

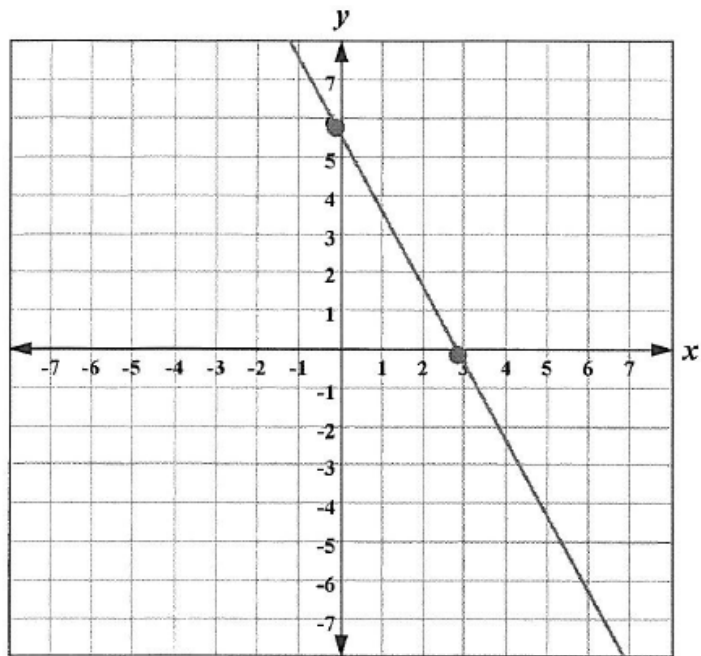
Question 4, Sample B – 1 point



Notes: This response shows the graph of $3x + y = 6$; however, the line should be dashed and the proper region should be shaded.

Classroom Extension: The response above is a good example to share with students. Students can discover, by substituting points that lie on the line into the inequality, that these points do not make the inequality true. Discuss with them that their graph should represent the solution set or set of points that make the inequality true. Then, ask them to substitute points on either side of the line into the inequality. Is there a pattern? Students should start to realize that all points above the line will make the inequality true and all other points do not.

Question 4, Sample C – 0 points



Notes: This response is incorrect and receives a score of zero points.

Reporting Category 5: Solving and Graphing Quadratic Equations

Question 5

Solve: $2x^2 - 3x - 5 = 0$

Answer _____

Exemplary Response:

- $x = -1, 5/2$

Rubric:

2 points: Exemplary response.

1 point: One correct solution. Or, solutions of $x = 1, -5/2$. Or, an answer left un-simplified.

0 points: Other

Question 5, Sample A – 2 points

Answer: 2.5, -1

Notes: This response is equivalent to the exemplary response.

Question 5, Sample B – 1 point

Answer: {5, -1}

Notes: This response gives one solution. This response suggests that the student may have rewritten the equation in factored form: $(2x - 5)(x + 1) = 0$. Then, the student may have tried to set each factor equal to zero, but mistakenly solved $x - 5 = 0$ instead of $2x - 5 = 0$. This is a common error that often occurs when students work too quickly, do not check their work, or do not completely understand this process.

Question 5, Sample C – 1 point

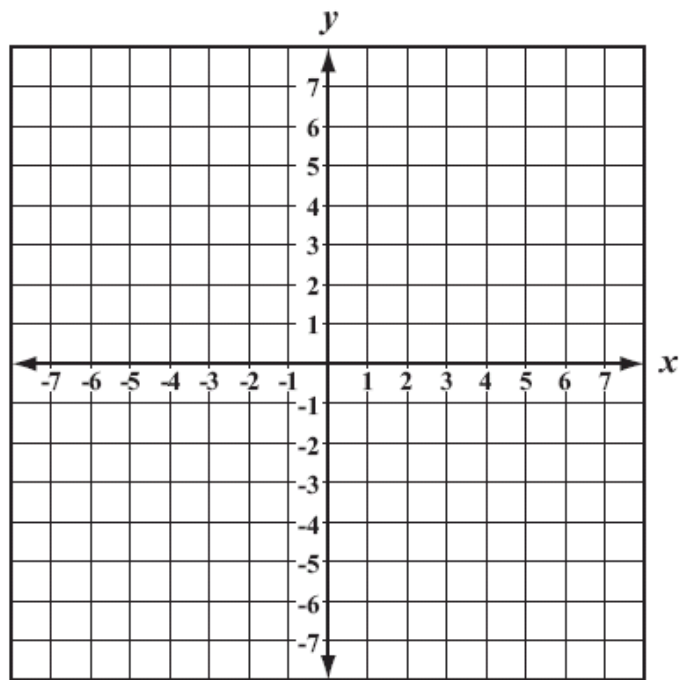
Answer: $(3 \pm 7)/4$

Notes: This response suggests that the student solved the equation using the Quadratic Formula, however, the expression is not simplified to indicate both solutions in simple form. This response demonstrates an ability to apply the Quadratic Formula to a certain degree, but further support is needed for this student to understand the entire process of using the Quadratic Formula. It may help students to reinforce that they are looking for values that make the equation true. This would also encourage students to check their answers after solving an equation.

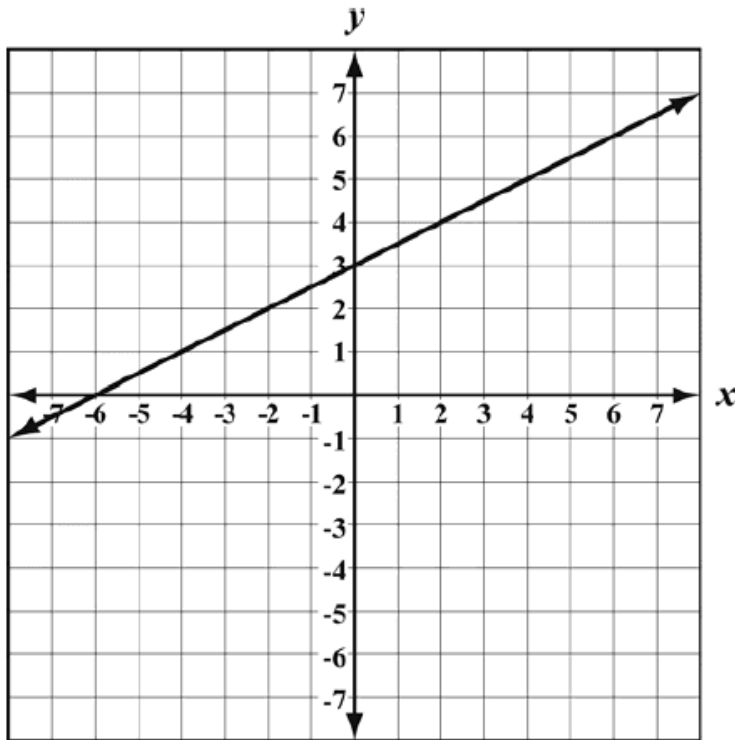
Reporting Category 2: Graphing and Interpreting Linear and Non-Linear Relations

Question 6

Graph: $-2x + 4y = 12$



Exemplary Response:



Rubric:

1 point: Exemplary response.

0 points: Other

Note: If more than one line is graphed or incorrect points are plotted, no points will be awarded.

Reporting Category 2: Graphing and Interpreting Linear and Non-linear Relations

Question 7

What are the x -intercept and y -intercept of the graph of $-3x + 5y = 30$?

x -intercept =

Answer _____

y -intercept =

Answer _____

Exemplary Response:

- x -intercept: $(-10, 0)$ or -10

And

- y -intercept: $(0, 6)$ or 6

Rubric:

2 points: Exemplary response.

1 point: One correct intercept given. Or, the correct intercepts are given, but they are given in the opposite answer boxes.
(For example, x -intercept = 6 and y -intercept = -10).

0 points: Other

Question 7, Sample A – 2 points

Part A: $(-10, 0)$

Part B: $(0, 6)$

Notes: This response is equivalent to the exemplary response.

Question 7, Sample B – 2 points

Part A: $x = -10$

Part B: $y = 6$

Notes: This response is equivalent to the exemplary response.

Question 7, Sample C – 1 point

Part A: -10

Part B: 15

Notes: This response gives the correct x-intercept; however, the y-intercept is incorrect.

Question 7, Sample D – 1 point

Part A: 6

Part B: -10

Notes: This response gives the correct intercepts; however, they are given in the opposite answer boxes.

Question 7, Sample E – 0 points

Part A: $-3/5$

Part B: -6

Notes: This response does not receive any points. Both parts are incorrect.

Reporting Category 2: Graphing and Interpreting Linear and Non-linear Relations

Question 8

Write an equation of a line with a y-intercept of 2 and an x-intercept of -4.

Answer _____

Exemplary Response:

- $y = \frac{1}{2}x + 2$

Or other equivalent equation

Rubric:

2 points: Exemplary response.

1 point: Correct slope is found, but the equation of the line is incorrect. Or, an incorrect slope is found and a correct equation based on the incorrect slope is given.

0 points: Other

Question 8, Sample A – 2 points

Answer: $2x - 4y = -8$

Notes: This response is equivalent to the exemplary response.

Question 8, Sample B – 1 point

Answer: $y = \frac{1}{2}x + 4$

Notes: This response shows the correct slope; however, the equation of the line is incorrect.

Question 8, Sample C – 1 point

Answer: $y = 2x + 2$

Notes: This response shows an incorrect slope. However, given the incorrect slope of 2, the equation given is correct based on that value and the other given information (y-intercept = 2). This response receives 1 point as the student demonstrates some understanding about writing equations.

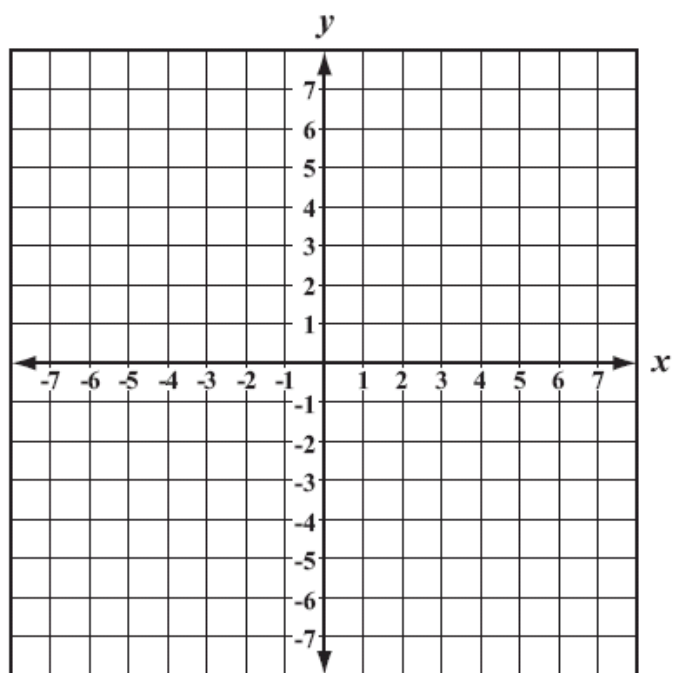
Question 8, Sample D – 0 points

Answer: $y = 2x + 4$

Notes: This response is similar to Sample C as the same incorrect slope is given. However, this response does not receive any credit since the equation given is not correct based on the incorrect slope and other given information.

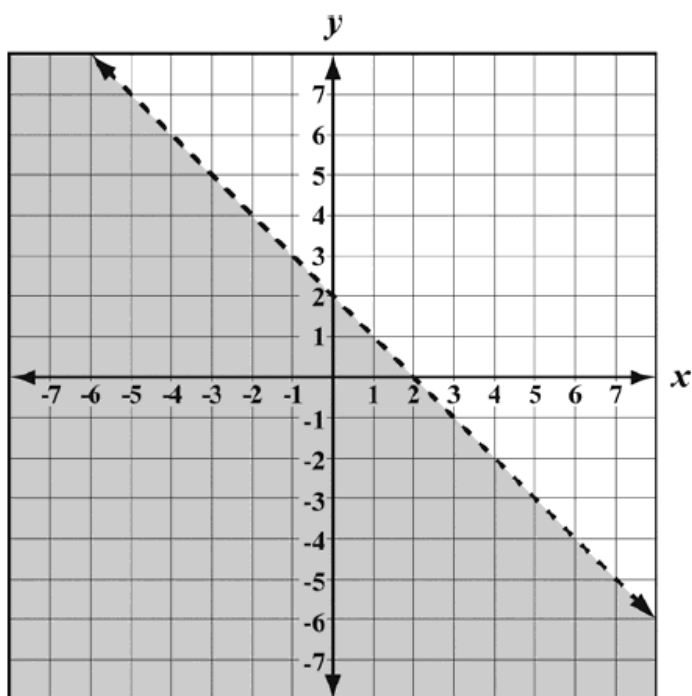
Question 9

Graph: $x + y < 2$



Exemplary Response:

- The graph of $x + y < 2$.



Rubric:

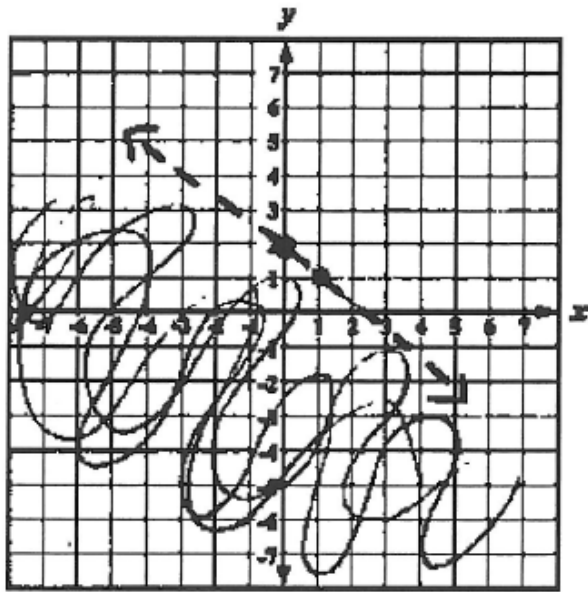
2 points: Exemplary response.

1 point: The graph of $x + y = 2$ using a solid or dashed line with incorrect or no shading. Or, an incorrect dashed line shaded correctly. Or, a correct solid line shaded correctly.

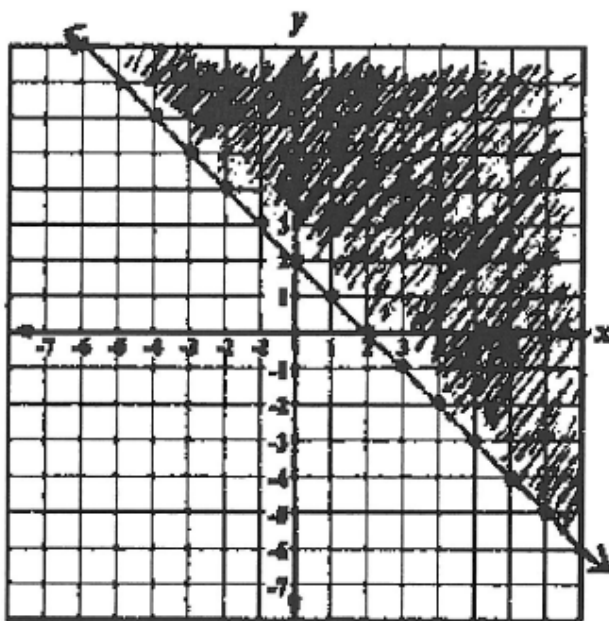
0 points: Other

Note: If more than one line is graphed or incorrect points are plotted, no points will be awarded.

Question 9, Sample A – 2 points

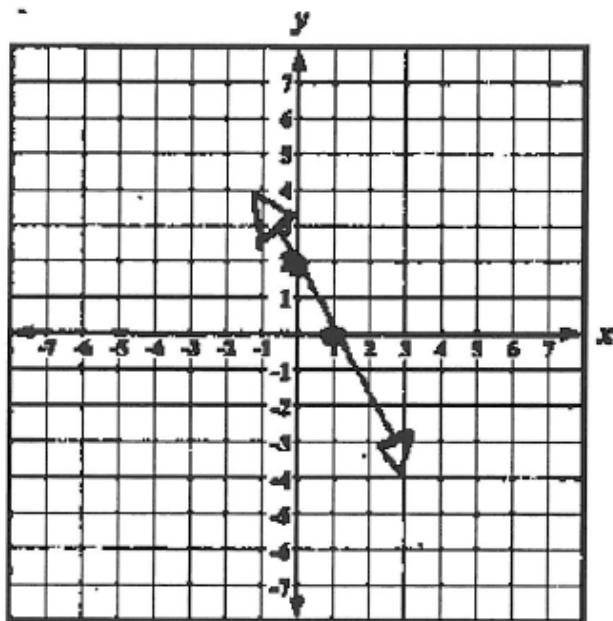


Notes: This response is equivalent to the exemplary response.



Notes: This response shows the correct line to represent $x + y = 2$; however, the line should be dashed, and the shading should be on the other side of the line. Precision is critical when communicating mathematics. It is important to stress the meaning of the inequality symbols and what they convey when representing a solution set to a linear inequality.

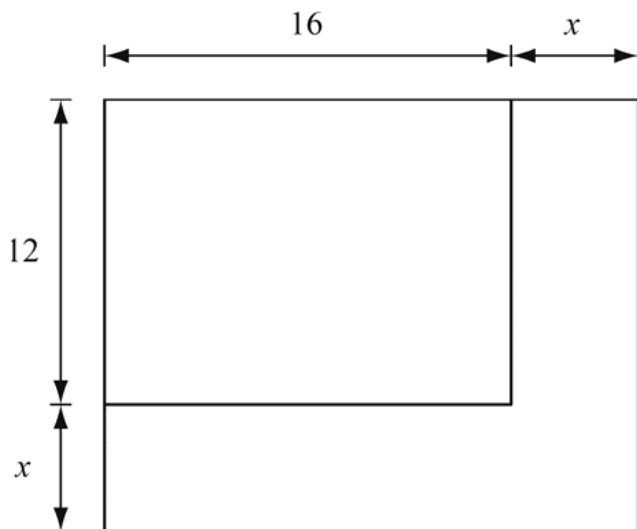
Classroom Extension: The response above is a good example to share with students. Ask them what this graph represents. It may be helpful to graph a 2-variable linear equation first and discuss what the line represents with respect to the equation. Students can discover, by substituting points that lie on the line into the equation, that these points will make the equation true. Students can then transfer this knowledge to inequalities and discover the meaning of solid versus dashed lines, and shaded regions versus un-shaded regions. When thinking about this particular graph and inequality, is the inequality true when you substitute points from the shaded region? What about the un-shaded region? What about points that lie directly on the boundary line?



Notes: This response is incorrect and does not receive any points.

Question 10 (This question was on a previous Algebra I ECA.)

Each dimension of a 12-foot by 16-foot garden will be increased by x feet, as shown in the diagram below.



Write an equation that can be used to determine the value of x , in feet, if the area of the enlarged garden is 525 square feet.

Answer _____

What is the PERIMETER, in feet, of the enlarged garden if the area is 525 square feet?

Answer _____

Exemplary Response:

- $(16 + x)(12 + x) = 525$

Or other equivalent equation.

And

- 92 feet

Rubric:

2 points: Exemplary response.

1 point: One correct component. Or, a correct answer in Part B based on an incorrect quadratic equation in Part A.

0 points: Other

Question 10, Sample A – 2 points

Part A: $525 = (16 + x)(12 + x)$

Part B: 92 feet

Notes: This response is equivalent to the exemplary response.

Question 10, Sample B – 1 point

Part A: $x^2 + 28x - 333 = 0$

Part B: 131.25 feet

Notes: This response gives a valid equation in Part A; however, the answer in Part B is incorrect.

Question 10, Sample C – 0 points

Part A: $525 = 16 + x * 12 + x$

Part B: 100 feet

Notes: Both parts of this response are incorrect. The equation given in Part A is missing parentheses which are necessary to represent the area of the enlarged garden and critical to indicate the appropriate order of operations. This is a good example to share with students when discussing precision and communication of mathematics.

Reporting Category 1: Solving Linear Equations and Inequalities

Question 11 (This question was on a previous Algebra I ECA.)

Kevin sells cars. He earns \$400 per week plus \$250 for every car (c) that he sells.

Write an equation that can be used to determine Kevin's weekly salary (W) given the number of cars (c) he sells.

Answer _____

How many cars must Kevin sell in a week to earn a weekly salary of \$1,400?

Answer _____

Exemplary Response:

- $W = 400 + 250c$

Or other equivalent equation.

And

- 4

Rubric:

2 points: Exemplary response.

1 point: A correct equation in Part A, or a correct solution in Part B. Or, a correct solution in Part B based on an incorrect linear equation in Part A.

0 points: Other

Question 11, Sample A – 2 points

Part A: $w = 250c + 400$

Part B: 4 cars

Notes: This response is equivalent to the exemplary response.

Question 11, Sample B – 1 point

Part A: $400 + 250c$

Part B: 4 cars

Notes: This response gives the correct solution in Part B; however, an expression representing Kevin's weekly salary is given in Part A rather than an equation.

Question 11, Sample C – 0 points

Part A: $w = 650c$

Part B: 750

Notes: Both parts of this response are incorrect.